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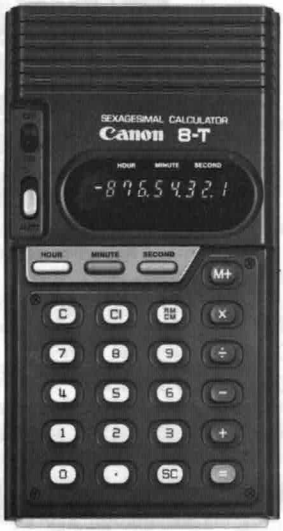
Canon

Sexagesimal Calculator

8-T

Palmtronic 8-T

English Edition



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Description

Operational Keys

⓪ ~ ⑨ **Numerical Keys** } Depressed for entering numerals.

⊙ **Decimal Point Key**

For example: 123 → ① ② ③
12.3 → ① ② ⊙ ③
0.123 → ⊙ ① ② ③

➕ ➖ ✖ ➗ 🟰 **Instruction Keys:** Depressed according to the calculation expression. If the 🟰 key is depressed, the calculation result (answer) is obtained.

Ⓒ **Clear Key:** Depressed for clearing all of entries and results except the memory.

Ⓒⓘ **Clear Indicator Key:** Depressed for correcting numeric entries.

* The Ⓒ Ⓒⓘ keys are also used for releasing the electronic lock actuated by mistake. For further details, see page 10.

M+ **Memory Plus Key:** Depressed for adding the displayed value to the memory.

RM CM **Recall-Clear Memory Key:** Depressed for recalling or clearing the memory contents. When the RM CM key is depressed, the memory contents are recalled and cleared at the same time.

SC **Sign Change Key:** Depressed for changing the sign of the indicated value.

HOUR **Hour Key:** Depressed for:
(1) Entering data in hour units.
(2) Converting sexagesimal data into decimal data in hour units and vice versa.

MINUTE **Minute Key:** Depressed for:
(1) Entering data in minute units.
(2) Converting sexagesimal data into decimal data in minute units and vice versa.

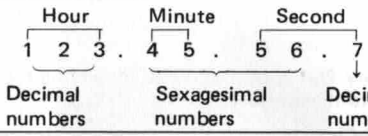
SECOND **Second Key:** Depressed for:
(1) Entering data in second units.
(2) Converting sexagesimal data into decimal data in second units and vice versa.

* The HOUR, MINUTE and SECOND keys have an adding function. The data entered by use of these keys can be accumulated without depressing the ➕ or ➖ keys.

AUTO **Automatic Sexagesimal Number Input Switch (Auto Switch):** Used for automatically entering sexagesimal data. When this switch is set at the AUTO side, sexagesimal data can be automatically entered only by entering sexagesimal values and depressing the instruction keys (➕ ➖ ✖ ➗ 🟰) or the M+ key. (It is not necessary to depress the HOUR, MINUTE or

SECOND key.)

The indicated sexagesimal data here collectively means the following values indicated in hours, minutes and seconds:



How to Load and Replace Batteries

< Loading >

Open the cover of the battery chamber on the back of the 8T. Mount two new penlight dry batteries in the chamber. Insert batteries with the minus (–) end first according to the drawing inside the chamber.

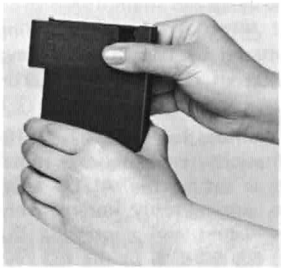
* The 8T will not operate if batteries are loaded in the wrong way.

< Replacing >

Batteries must be replaced when the display becomes dim. Replace both batteries at once.

If the capacity of the batteries decreases, calculation becomes impossible.

* Be sure to take the batteries out of the calculator if it is not to be used for more than one month.



AC Adapter

The 8T can operate either with batteries or from a household power source (AC power) by using Canon AC Adapter AD-2.

* Do not connect any other AC adapter to the 8T.

How to Use the Canon AC Adapter AD-2

1. Plug the AD-2 into a receptacle.
2. Insert the output plug of the AD-2 into the AC adapter jack of the 8T.
3. Then, turn on the Power Switch of the 8T.

* Since the Canon AC Adapter AD-2 is designed specifically for Canon's calculators, do not try to use it with other electric machines.
* Unplug the AD-2 from the receptacle after use.

How to Perform Calculations

1. Slide the power switch to ON, then depress the C key.
2. After the = key is depressed, the calculator is automatically cleared. Therefore, it is not necessary to depress the C key before starting the next calculation.

* Please keep in mind that accurate results depend on correct key operation.

General Calculation (Calculation of Decimal Data)

Expression	Operation (Display)
Addition and subtraction	
$8+3-4.5=(6.5)$	8 ⊕ 3 ⊖ 4.5 ⊜ (6.5)
$-9+2+3=(-4)$	9 (SC) ⊕ 2 ⊕ 3 ⊜ (− 4.)
Multiplication and division	
$5\times3\div0.7=$ (21.428571)	5 ⊗ 3 ÷ .7 ⊜ (21.428571*)
Mixed calculation	
$9\div5\times3+7=$ (12.4)	9 ÷ 5 ⊗ 3 ⊕ 7 ⊜ (12.4)

* Calculation results less than 8 digits are discarded.

Constant multiplication	
$2\times3=(6)$	2 ⊗ 3 ⊜ (6.)
$2\times4=(8)$	4 ⊜ (8.)
$2\times5=(10)$	5 ⊜ (10.)
Constant division	
$6\div3=(2)$	6 ÷ 3 ⊜ (2.)
$9\div3=(3)$	9 ⊜ (3.)
$12\div3=(4)$	12 ⊜ (4.)

The multiplicand in multiplication and the divisor in division are constants.

Raising to powers	
$3^4=(81)$	3 ⊗ ⊜ ⊜ ⊜ (81.)

In power calculation, the nth power can be obtained by depressing the ⊜ key $(n-1)$ times.

Reciprocal calculation	
$\frac{1}{2\times3+4}=(0.1)$	2 ⊗ 3 ⊕ 4 ÷ ⊜ ⊜ (0.1)

Reciprocal numbers can be obtained by depressing the ÷, ⊜ and ⊜ keys continuously.

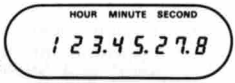
Expression	Operation (Display)
Calculations using memory (Products, sums and differences)	
$20\times30=$ (600)	20 ⊗ 30 ⊜ M+ (600.)
$40\times50=$ (2000)	40 ⊗ 50 ⊜ M+ (2000.)
$15\times20=$ (300)	15 ⊗ 20 ⊜ M+ (300.)
Subtotal (2900)	RM/CM M+ (2900.)
$-125\times40=(-5000)$	125 (SC) ⊗ 40 ⊜ M+ (− 5000.)
Total (−2100)	RM/CM (− 2100.)
Composition ratio calculation	
Percentage (%)	
A 125 (25)	125 ⊕ 185 ⊕ 190 ⊜
B 185 (37)	(500.)
C 190 (38)	÷ 100 ÷ ⊜ 125 ⊜ M+
Total (500) (100)	(25.)
	185 ⊜ M+ (37.)
	190 ⊜ M+ (38.)
	RM/CM (100.)

How to Perform Sexagesimal Calculations

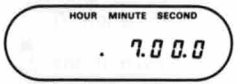
1. How to Enter Sexagesimal Data

1) When the HOUR, MINUTE and SECOND keys are used: Depress the HOUR key after entering hour data, the MINUTE key after entering minute data, and the SECOND key after entering second data. Hour, minute and second data may be entered in any order.

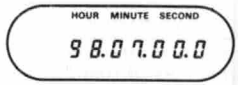
Example 1) 123: 45'27.8"
Operation 123 HOUR 45 MINUTE 27.8 SECOND



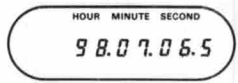
Example 2) 98: 7'6.5"
Operation 1) 7 MINUTE



2) 98 HOUR

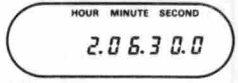


3) 6.5 SECOND



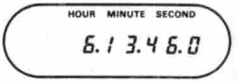
* When decimal data is entered and the HOUR, MINUTE or SECOND keys are depressed, the data is converted into sexagesimal data on the basis of the key depressed.

Example) 126.5 minutes → 2: 06'30"
Operation 126.5 MINUTE



* The HOUR, MINUTE and SECOND keys have an adding function, the data entered by use of these keys are accumulated.

Example) 2: 35' + 3: 25' + 13'46" → 6: 13'46"
Operation 2 HOUR 35 MINUTE 3 HOUR 25 MINUTE 13 MINUTE 46 SECOND



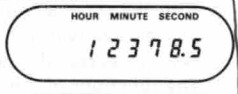
2) When the AUTO switch is set:
Enter simply the sexagesimal values. It is not necessary to depress the HOUR, MINUTE, SECOND, keys. By depressing the instruction key or M+ key next, the values entered are entered as sexagesimal data (Example 1). However, the values entered after depressing of the × or ÷ key are calculated as decimal data (Example 2).

* If values need be entered as sexagesimal data after depression of the ÷ key, depress the HOUR, MINUTE and SECOND keys after entering the values (Example 3).

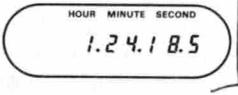
Even if the AUTO switch is set, it is possible to use the HOUR, MINUTE and SECOND keys to save the operation steps (Example 4).

Example 1)
1: 23' 78.5" ⟶ 1: 24' 18.5"
Carry

Operation AUTO 12378.5

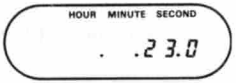


+

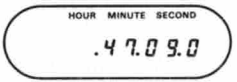


Example 2)
23" x 123 = ⟶ 47' 09"

Operation AUTO 23 ×

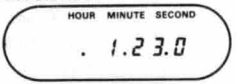


123 =

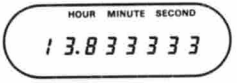


Example 3)
1' 23" ÷ 6" ⟶ 13.833333

Operation AUTO 123 ÷

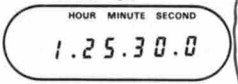


6 SECOND =

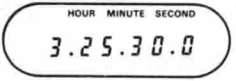


Example 4)
1: 25' 30" + 2: 00' 00" 3: 25' 30"

Operation AUTO 12530 +



2 HOUR =



* When the AUTO switch is set, no constant multiplication or division can be performed.

2. How to Correct Numerals

If a wrong value is entered, clear the indicated value with the CI key, then enter correct values. (However, the CI key will not clear the value after the instruction key is depressed. In this case clear with the C key.) The functions of the CI key are:

1) When the CI key is depressed after entering of a value, only the value entered is cleared.

Example 1) 2 + 3 CI 4 = (6.)

3 is cleared.

Example 2) 12 HOUR + 3 HOUR 15 CI 46 MINUTE =

(15.46.00.0)

15 is cleared.

2) When the CI key is depressed twice continuously after the entering of sexagesimal data or when the CI key is depressed after the depressing of the HOUR, MINUTE and SECOND keys, the sexagesimal data entered is cleared.

Example 1) 12 HOUR + 3 HOUR 15 CI CI

15 is cleared.

3 hours is cleared.

4 HOUR = (16.00.00.0)

Example 2) 12 HOUR + 3 HOUR 46 MINUTE CI

3:46' is cleared.

7 HOUR = (19.00.00.0)

3. Possible and Impossible Calculation

Possible and impossible calculations of decimal data and sexagesimal data are shown in the following table.

When impossible calculations are made, errors result.

Data		Addition and subtraction	Multiplication	Division
Operand	Operator			
Decimal	Decimal	○	○	○
Decimal	Sexagesimal	X *	○	X *
Sexagesimal	Decimal	X *	○	○
Sexagesimal	Sexagesimal	○	X *	○

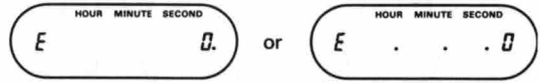
* These calculations are also impossible mathematically.

4. Overflow Errors

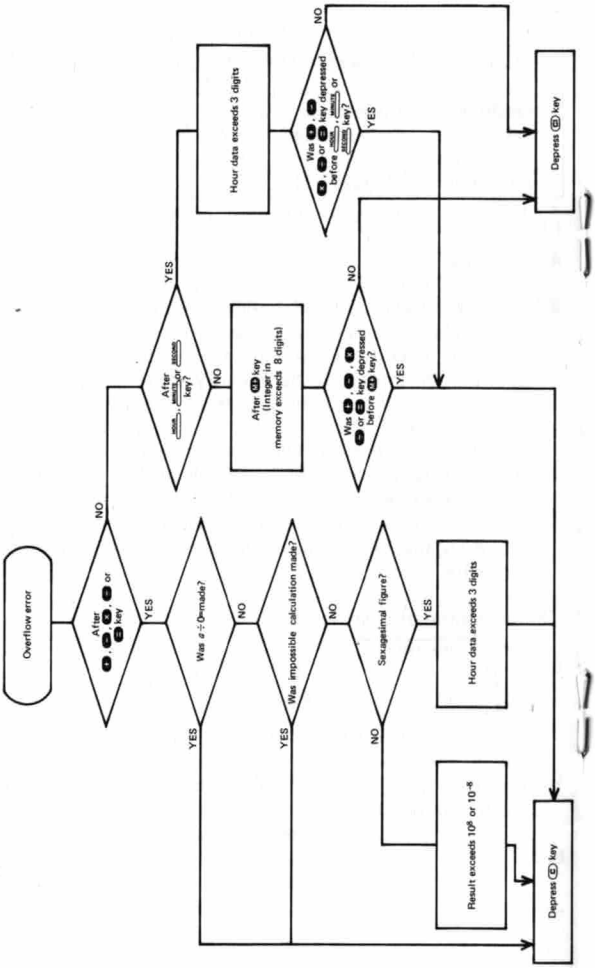
In the following cases, overflow errors occur, the calculator is electronically locked, and subsequent entering of values and calculations become impossible:

1) When a result of calculation exceeds 10^8 or 10^{-8}.
2) When an integer in the memory exceeds eight digits.
3) When $a \div 0$ (a division in which the divisor is 0) is performed.
4) When an impossible calculation is made.
5) When decimal data and sexagesimal data are entered into the memory at the same time.
6) When hour data exceeds three digits.
7) When the hour data in the memory exceeds three digits.

The indication of overflow is:



Release the electronic lock with the C or CI key. (Refer the flowchart next page for deciding which of the C and CI keys should be used for removing the electronic lock.)

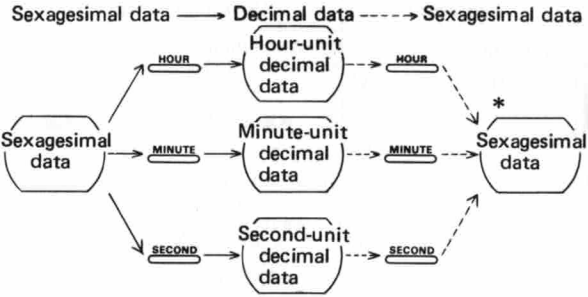


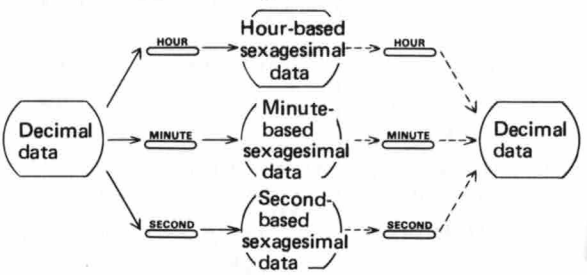
Hour data exceeds 3 digits
Was + or − key depressed before ×, ÷, =, M+, M− or ÷ key?
Depress (C) key
After ×, ÷, =, M+, M− or ÷ key?
After + or − key integer in memory exceeds 8 digits
Was + or − key depressed before ×, ÷, =, M+, M− or ÷ key?
NO
YES

Calculation Examples

Expression	Operation (Display)
Addition 12 : 34′ 56.7″ + 3′ 6.9″ = 12 : 38′ 3.6″	(1) When data is entered by use of hour, minute and second keys: 12 HOUR 34 MINUTE 56.7 SECOND + 3 MINUTE 6.9 SECOND = (12.38.03.6) (2) When addition is done by use of hour, minute and second keys: 12 HOUR 34 MINUTE 56.7 SECOND 3 MINUTE 6.9 SECOND (12.38.03.6) (3) When data is entered by use of Auto switch: AUTO 123456.7 + 306.9 = (12.38.03.6)
Subtraction 3 : 25′ 36″ − 5 : 30′ 40″ = −2 : 5′ 4″	3 HOUR 25 MINUTE 36 SECOND − 5 HOUR 30 MINUTE 40 SECOND = (−2.05.04.0)
Multiplication 1 : 45′ 10″ × 365 = 639 : 45′ 50″	(1) When data is entered by use of hour, minute and second keys: 1 HOUR 45 MINUTE 10 SECOND × 365 = (639.45.50.0) (2) When data is entered by use of Auto switch: AUTO 14510 × 365 = (639.45.50.0)
Division 125 : 30′ ÷ 15′ = 502	125 HOUR 30 MINUTE ÷ 15 MINUTE = (502.)
500 hours ÷ 135 = 3 : 42′ 13.3″	500 HOUR ÷ 135 = (3.42.13.3)

Conversion with Sexagesimal Data and Decimal Data





* Conversion is made on the basis of the decimal data displayed. Therefore, if discarding is done in the process of conversion of sexagesimal data into decimal data, some error may arise between the original sexagesimal data and the ultimate sexagesimal data.

Expression	Operation (Display)
Conversion with sexagesimal data and decimal data 12 hours 15 minutes → 12.25 hours 12 hours 15 minutes → 735 minutes 12 hours 15 minutes → 44100 seconds	12 HOUR 15 MINUTE HOUR (12.25) (*) HOUR (12.15.00.0) MINUTE (735) (*) MINUTE (12.15.00.0) SECOND (44100.)
13626" → 3 : 47' 06"	13626 SECOND (3.47.06.0)
28.3km/h → 0.47166km/min Note: 1 km = 0.62 mile	28.3 MINUTE HOUR (0.47166)

* In the conversion of sexagesimal data into decimal data, when decimal data is further converted into decimal data of a different unit, the key representing the unit must be depressed after the first decimal datum is once converted into sexagesimal data.

Note: In the following key operations, the data converted into sexagesimal data is not entered into the calculation.

1) 12 × HOUR 3 = (36.)
   → 12 hours is not entered.
2) 12 HOUR 3 × 6 = (18)
   → 12 hours is not entered.
3) 12 HOUR × HOUR 3 = . . . (36.00.00.0)
   → 12 hours are not entered.

Applied Calculations

Road Rally

Example 1) A car started at 8:41′ at an average speed of 28.3 km/h. How many kilometers will the car have run by 9:00′? Note: 1 km = 0.62 mile

(Expression)

9:00′ − 8:41′ = (19′ → 0.31666 hour) x 28.3 = 8.961478 km

(Operation)

9 HOUR − 8 HOUR 41 MINUTE = HOUR × 28.3 = (8.961478)

Example 2) A car started at 8:41′ at an average speed of 28.3 km/h. When will the car pass a point of 12.3 km?

(Expression)

12.35 ÷ 28.3 = (0.4363957 hour → 26′11″) + 8:41′ = 9:07′11″

(Operation)

12.35 ÷ 28.3 = HOUR + 8 HOUR 41 MINUTE = (9.07.11.0)

Worker Efficiency

Example 3) How high is the efficiency of work when 23 units of a product are made per day?
Working hours: 8 hours
Attendance ratio: 0.95
Operating ratio: 0.95
Average time: 17′19.6″

(Expression)

Efficiency of work

$$= \frac{\text{Average time} \times \text{Number of units} \times 100}{\left(\begin{matrix}\text{Working}\\ \text{hours}\end{matrix}\right) \times \left(\begin{matrix}\text{Attendance}\\ \text{ratio}\end{matrix}\right) \times \left(\begin{matrix}\text{Operating}\\ \text{ratio}\end{matrix}\right)}$$

$$= \frac{17'19.6'' \times 23 \times 100}{8 \text{ hours} \times 0.95 \times 0.95} = 91.99292$$

(Operation)

17 MINUTE 19.6 SECOND × 23 × 100 ÷ 8 HOUR ÷ 0.95 ÷ 0.95 = (91.99292)

Wage Calculation

Example 4) Based on the time table below, obtain the working hours and calculate the wages payable. Note that the wage rate per hour is $10.

Day	Attendance time	Leaving time	Dining hours	Break time
Mon.	8:15′	16:30′	1 hour	30 min.
Tue.	9:00′	14:30′	45 min.	30 min.
Wed.	14:30′	22:00′	1 hour 30min.	30 min.
Thu.	15:00′	22:00′	45 min.	30 min.
Fri.	8:30′	16:30′	1 hour	30 min.

(Expression)

Working hours = (leaving time − attendance time) − dining hours − break time

(Operation)

16 HOUR 30 MINUTE − 8 HOUR 15 MINUTE
− 1 HOUR − 30 MINUTE = M+ (6.45.00.0)
. . . . . Working hours on Mon.

14 HOUR 30 MINUTE − 9 HOUR
− 45 MINUTE − 30 MINUTE = M+ (4.15.00.0)
. . . . . Working hours on Tue.

22 HOUR − 14 HOUR 30 MINUTE
− 1 HOUR 30 MINUTE − 30 MINUTE = M+ (5.30.00.0)
. . . . . Working hours on Wed.

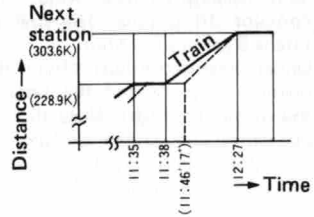
22 HOUR − 15 HOUR − 45 MINUTE
− 30 MINUTE = M+ (5.45.00.0)
. . . . . Working hours on Thu.

16 HOUR 30 MINUTE − 8 HOUR 30 MINUTE
− 1 HOUR − 30 MINUTE = M+ (6.30.00.0)
. . . . . Working hours on Fri.

RM CM (28.45.00.0) . . . . . Working hours per week
HOUR (28.75)
× 10 = (287.5)

Time Schedule for Railroad

Example 5) Train A started from a station 8′17″ behind the schedule. The train must arrive at the next station on schedule. Then, at what average hourly speed does the train have to run?



The diagram shown here is the train operating table.

The broken line indicates the delay of 8′17″.

The distance to the next station:

303.6 − 228.9 = 74.7 (km)

The scheduled time required:

12:27 − 11:46′17″ = 40′43″

(Expression)

Average speed obtained =

$$\frac{303.6-228.9}{(12:27'-11:38'-8'17'' \rightarrow \text{Converted into hours})}$$

(Operation)

(RM CM) 12 HOUR 27 MINUTE − 11 HOUR 38 MINUTE − 8 MINUTE 17 SECOND = HOUR M+ (0.67861)
. . . . . Scheduled time required (hour)

303.6 − 228.9 ÷ RM CM =
(110.07795)
. . . . . Average speed obtained (km/hour)

Example 6) I decided to fly by Cessna Plane to Izu seven islands. The navigation speed outbound is 150 miles per hour because of tail wind. The navigation speed inbound is 110 miles per hour because of head wind. The fuel tank contains 10 gallons. The fuel consumption rate is 8 gallons per hour.
Under these conditions, obtain the maximum possible distance and the time required for the outbound flight. Note that the point of departure and arrival is Tokyo airport and that the distance to Izu seven islands is as shown in the diagram below.

(Expression)

$$\text{Max. possible distance} = \frac{\text{Loaded fuel}}{\left(\frac{\text{Fuel consumption rate}}{}\right)} \times \frac{(\text{Outbound speed}) \times (\text{Inbound speed})}{(\text{Outbound speed} + \text{Inbound speed})}$$

$$= \frac{10}{8} \times \frac{150 \times 110}{150 + 110}$$

$$\text{Outbound hours required} = \frac{\text{Max. possible distance}}{\text{Outbound speed (150)}}$$

(Operation)

10 ÷ 8 × 150 M+ × 110 M+ ÷ (RM CM) ÷
(79.326923)
..... Max. possible distance (mile)
150 = HOUR
(.31.43.8)
..... Outbound hours required

Therefore, it is possible to fly from Tokyo to the neighborhood of Niijima.

Orienteering

Example 7) Based on the time recorded below, obtain the ranking at the orienteering competition. Note that there are 10 posts.

	Staring time	Arrival time	Elapsed time	Number of penalties	Penalty time	Total time	Ranking
A	10:00′	12:05′30″	(2:05′30″)	0	0	(2:05′30″)	(2)
B	10:05′	12:04′40″	(1:59′40″)	2	(48′16″)	(2:47′56″)	(5)
C	10:10′	12:13′15″	(2:03′15″)	0	0	(2:03′15″)	(1)
D	10:15′	12:17′25″	(2:02′25″)	1	(24′08″)	(2:26′33″)	(4)
E	10:20′	12:19′55″	(1:59′55″)	1	(24′08″)	(2:24′03″)	(3)

(Expression)

Elapsed time = Arrival time − Starting time

Time per penalty = *Standard time ÷ Number of posts

*Standard time = (The average time of the fastest three times) x 2

Penalty time = Time per penalty x Number of penalties

Total time = Elapsed time + Penalty time

(Operation)

AUTO 120530 − 10 HOUR = (2.05.30.0)
. . . . . Elapsed time of A

120440 − 10 HOUR 5 MINUTE = (1.59.40.0)
. . . . . Elapsed time of B

121315 − 10 HOUR 10 MINUTE = (2.03.15.0)
. . . . . Elapsed time of C

121725 − 10 HOUR 15 MINUTE = (2.02.25.0)
. . . . . Elapsed time of D

121955 − 10 HOUR 20 MINUTE = (1.59.55.0)
. . . . . Elapsed time of E

15940 + 20225 + 15955 = ÷ 3 ×
2 = (4.01.20.0)
. . . . . Standard time

÷ 10 = (.24.08.0) . . . . . Time per penalty

× 2 = (.48.16.0) . . . . . Penalty time of B

15940 + 48 MINUTE 16 SECOND = (2.47.56.0)
. . . . . Total time of B

20225 + 24 MINUTE 8 SECOND = (2.26.33.0)
. . . . . Total time of D

15955 + 24 MINUTE 8 SECOND = (2.24.03.0)
. . . . . Total time of E

Specifications

Type: "Palmtronic" (Miniaturized) electronic calculator.

Keyboard: 10-key system

Display: Fluorescent tube.
8 digits + 1 digit (sign display digit)

Register: 3 calculating registers. 1 memory register.

Calculation capacity: (Decimal) 8 digits for all calculations.
Sexagesimal calculation capacity ±999 hours 59 minutes 59.9 seconds ~±0.1 second

Decimal point system: (Decimal) Floating system
(Sexagesimal) Fixed system

Negative numbers: True value indication with a minus sign.

Types of calculations: (Decimal) Addition, subtraction, multiplication and division. Chain multiplication and division. Constant calculations.
Square calculations. Raising to powers. Reciprocal calculations. Sum and difference of products and quotients. Various mixed calculations.
(Sexagesimal) Addition, subtraction, multiplication and division. Chain calculations. Various mixed calculations.

Indication functions: Zero suppressed indication. overflow sign. minus sign. hour, minute and second indication.

Elements: LSI

Power source:

1. 2 penlight dry batteries (size AA) DC 3V 0.3W High-performance manganese batteries for approximately 8 hours of use.
   Alkaline batteries for approximately 12 hours of use.
2. AC with the Canon AC Adapter AD-2 (Option).

Usable temperature: 0°C – 40°C (32°F – 104°F)

Size: 76mm wide x 140mm long x 19mm high
(2-5/8″ x 5-5/16″ x 7/16″)

Weight: 165g (5.8 oz.) including dry batteries

Subject to alterations without notice.